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The Effect of Pre-meal, Vocal Re-creative Music Therapy on Nutritional Intake of Residents with Alzheimer's Disease and Related Dementias: A Pilot Study

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Introduction

Singing has long been credited with a wide variety of physical, mental, and social health benefits (Hunter, 1999). Recent scientific inquiry points to the efficacy of singing toward enhanced cardiovascular and pulmonary performance (Bonilha, Onofre, Vieira, Prado, & Martinex, 2009), verbal communication (Wan, Rüber, Hohmann, & Schlaug, 2010), and immune functioning and attendant affective states (Kreutz, Bongard, Rohrmann, Hodapp, & Grebe, 2004; Kuhn, 2002; Unwin, Kenny, & Davis, 2002). Among older adults, singing has been linked with improved mood, better quality of life, greater happiness, stress reduction, and emotional wellbeing (Clift, Hancox, Morrison, Hess, Kreutz, & Stewart, 2010).

In our own work, we have noticed repeatedly the benefits of singing with older adults with Alzheimer's Disease and related dementias (ADRD). Individuals who show signs of hyper-arousal (i.e., restlessness, agitation, and/or purposeless or perseverative behavior) tend to become calmer and more meaningfully involved after just 20 to 30 minutes of active engagement in singing. Individuals who are hypo-aroused (i.e., sleepy, depressed, and/or nonresponsive) tend to become more alert, physically active, and socially interactive by the end of a session in which singing has been a primary focus. In this way, singing appears to serve a regulative function, as posited by Aldridge (2007)—that is, it has the capacity to compose and soothe individuals who are disorganized or anxious and arouse those with abnormally diminished levels of physical and cognitive activity, thereby moving both profiles to more optimal functioning. Additionally, our

perception has been that this improved functioning often "carries over" into other daily activities. These observations regarding singing led us to question whether pre-meal singing might be an efficacious way to combat the malnutrition to which so many individuals with ADRD are vulnerable.

Review of Literature

ADRD and Malnutrition

ADRD are progressive, neurodegenerative disorders that affect the part of the brain that controls memories, thoughts, and language skills (Alzheimer's Association, 2011). As such, a person's ability to complete critical daily activities is typically compromised. One of these daily activities is eating; in fact, feeding difficulties and resulting malnutrition become pressing concerns as dementia progresses (Volicer & Hurley, 1997). Individuals in the middle stages of ADRD may forget to eat or how to feed themselves. Those in the later stages are at particular risk for malnourishment in that they may lose their ability to chew and swallow (Rouse & Gilster, 1994) and food may fall out of their mouths due to lack of proper oral manipulation (Watson & Green, 2006). Poor communication between patients and their caregivers may also be a factor contributing to malnutrition, as those affected by dementias grow increasingly dependent on others and yet are less able to verbally express their needs and understand others' directions (Athlin & Norberg, 1989; Lou, Dai, Huang, & Yu, 2007). Without a doubt, malnutrition can compromise physical and cognitive functioning, thereby negatively affecting the quality of life for individuals with ADRD and contributing to terminal decline (Hurley & Volicer, 2002).

Background Music in the Dining Environment

The incorporation of recorded background music in the dining environment has been found to decrease agitation and other characteristic symptoms of ADRD that impede productive eating, such as wandering, irritability, and depression (Chang, Huang, Lin, & Lin, 2010; Denney, 1997; Goddaer & Abraham, 1994; Ragneskog, Brane, Karlsson, & Kihlgren 1996; Ragneskog, Kihlgren, Karlsson, & Norberg, 1996; Richeson & Neill, 2004; Thomas & Smith, 2009). In fact, background music appears to be the most frequently studied intervention toward the alleviation of feeding difficulties among individuals with various dementias, according to a systematic review by Watson and Green (2006). Some investigators who have introduced background music during mealtimes have targeted measures of agitation as the dependent variable (Denney, 1997; Goddaer & Abraham, 1994; Ragneskog, Kihlgren, Karlsson, & Norberg, 1996), while others have examined interaction and participation at meals (Davies & Snaith, 1980), time spent eating (Ragneskog et al., 1996) or approximate measures of food consumed (Ragneskog, Brane, Karlsson, & Kihlgren 1996).

Active Music Engagement

An alternative to the use of background music to mitigate symptoms of dementia is the use of active music engagement, in which the client and therapist make music together using their voices or instruments. Active engagement has been found to combat the apathy, boredom, depression, and loneliness that typically accompany dementia and its progression (Cohen-Mansfield, Dakheel-Ali, & Marx, 2009). Music therapists have investigated the impact of music engagement on various emotional, behavioral, and physiological aspects of functioning among residents with ADRD. Qualitative and

quantitative outcomes indicate that individual and group engagement in music-based experiences can modify mood (Hanser & Thompson, 1994; Suzuki, 1998), improve reality orientation (Riegler, 1980; Smith-Marchese, 1994) and cognition (Bruer, Spitznagel, & Cloninger, 2007; Prickett & Moore, 1991), decrease agitation and irritability (Brotons & Marti, 2003; Brotons & Pickett-Cooper, 1996; Choi, Lee, Cheong, & Lee, 2009; Lipe, 1991; Suzuki, Kanamori, Nagasawa, Tokiko, & Takayuki, 2007; Svansdottir & Snaedel, 2006), decrease wandering (Groene, 1993), increase speech content and fluency (Brotons & Koger, 2000), reduce apathy (Holmes, Knights, Dean, Hodkinson, & Hopkins, 2006; Moore, 2010), increase positive social interaction (Brotons & Marti, 2003; Pollack & Namazi, 1992), improve physiological/immunological functioning (Kumar et al., 1999; Takahashi & Matsushita, 2006), and enhance overall quality of life (Ahonen-Eerikainen, Rippin, Sibille, Koch, & Dalby, 2007). (Additional relevant literature from 1986 to 1998 appears in Broton's chapter, "An Overview of the Music Therapy Literature Relating to Elderly People" in *Music Therapy in Dementia Care* [Aldridge, 2000]).

While the above is an impressive list of benefits for a relatively new stream of inquiry, the majority of these studies have focused on the residents' engagement in a *multiplicity* of interventions (e.g., instrumental activities, musical games, movement to music, singing, etc.), rather than in a *single* intervention. This is particularly true of studies in which "music therapy" is labeled as the independent variable. While the use of multiple interventions in research mimics characteristic music therapy in dementia care (in which an assortment of methods and their variations are employed in a single music therapy session), the end result is that it is, of course, impossible to "tease out" which of

these particular music-based interventions or factors surrounding their implementation may be responsible for the alleged benefits. With this in mind, the sections below present literature specifically related to singing and dementia and singing and nutritional intake.

Singing and Dementia

A number of well-regarded music therapy clinicians and researchers have advanced the rationale for and benefits of singing with elderly individuals who have been diagnosed with dementia. Clair (2000) writes

> Singing is integral to the life quality of those who are in progressive dementia and their caregivers. It functions to provide islands of arousal, awareness, familiarity, comfort, community and success like nothing else can. It is particularly valuable as an intervention because it is accessible to a wide array of individuals, since it has no prerequisites for prior musical skills or training, and it can include persons across cultures and socio-economic strata. It is also effective in severe, late stage dementia when responses to other stimuli are non-existent. Singing successfully engages individuals in meaningful purposeful participation through the disease trajectory. (p. 93)

In her dissertation, Ridder (2003) substantiates claims that singing is

> …a popular activity that can be adapted to levels of functioning and with positive effect on oxygen uptake, immune defenses, stress, agitation, social behavior, relaxation, language function, cognition, participation, periods of lucidity, feeling of identity, and reminiscence. (p. 47)

Ridder (n.d.) also writes about her individual work and research with patients who have dementia, stating that

> Singing is a viable source of stimulation and interaction, an alternative method of communication, reduces agitation and promotes engagement in an activity, as well as interaction with another human being. (*http://www.musictherapyworld.de/modules/archive/stuff/papers/HanneMe.pdf*)

In our literature search, we were able to locate only a few systematic studies published in English in which singing was the featured independent variable and for which discrete quantitative or qualitative data were collected toward greater understanding of the impact of this particular method in dementia care. As we read, we began to notice that in some cases, when "singing" was indicated as the independent variable/intervention, the authors were referring to singing *with* the residents, or what we would call "active music engagement", while in other cases they were clearly describing singing *for* the residents (Carruth, 1997; Clair, 1996), or what we might call "receptive music engagement". Sometimes "singing" referred to both singing *with* and singing *for* (Götell, Brown, & Ekman, 2009; Marmstål Hammar, Amami, Engström, & Götell, 2010; Ridder & Aldridge, 2005), and sometimes the nature of the intervention was left unspecified. We viewed these distinctions as important and applied them in order to cull irrelevant studies, given that our interest was in residents' active engagement in singing rather than the receptive use of song material.

One of the earliest reports linking the systematic application of engagement in singing to therapeutic outcome appeared in 1989. Olderag-Millard and Smith aimed to test the short- and long-term effectiveness of singing familiar songs on several behaviors associated with dementia. Ten care facility residents with AD served as their own

controls, participating in two conditions over a 5-week period: 30-minute group discussion sessions (baseline) and 30-minute group music therapy sessions (treatment). In each music therapy session, songs determined to be familiar to the residents were presented with guitar accompaniment. Participants were "reinforced" for singing along with the researcher. During each session in both conditions, as well as for 30 minutes after each session, behavior mapping was used to log behaviors such as sitting, standing, walking alone and with others, watching others, smiling, and verbalizing. Although both discussion and singing effected positive changes, the greatest change was observed in the singing group. Results showed that "Sitting" and "Walking With Others" were greater when the residents were singing. Also noted in the singing session was a higher level of vocal/verbal participation. The post-session observations revealed that the incidence of "Walking With Others" was significantly greater for singing than for discussion. The authors write, "Although difficult to document, socialization and a feeling of 'group unity' seemed to increase in music sessions" (p. 67), citing as support the residents' compassionate acts toward one another (e.g., offering one's chair for another and holding hands).

Götell, Brown, and Ekman (2000) describe a comprehensive ethnographic study in which singing of familiar songs figured prominently in "music events" at a geriatric clinic in Sweden. The purpose of the study was to elucidate the importance of music and the reactions and social interactions of the participants, who were 35 women and 15 men with dementia/suspected dementia and their caregivers—nurses, occupational therapists, physiotherapists, and students in these fields. Music leaders conducted 40-minute sessions two mornings per week, as they had been doing for several years prior to data

collection. Each session included singing a warm-up song with the participants' names, singing four to seven familiar songs, movement exercises to song, and a closing song. Results indicated that most participants were able to sing with the leaders and that they showed increased attention and joy during the singing—making cogent remarks, smiling warmly, rocking in time to the music, joking and making puns, reporting distant and pleasant memories, and singing songs in their native languages. Post music event data showed positive effects as well. The authors write, "Immediately after the music events, some of the patients seemed to show increased attention and to be full of vitality and fun. They were quite talkative, and attempted to converse with one another" (p. 122).

Lesta and Petocz (2006) used applied behavior analysis to measure the impact of "familiar group singing" on responses related to mood (e.g., flat, anxious, etc.) and nonsocial and social behaviors (e.g., wandering, touching of face/clothes, sitting alone, etc.) of four female residents with middle stage dementia. All women displayed characteristics of "sundowning", which is a period of high disorientation and anxiety appearing in the late afternoon to early evening among certain individuals with dementia (Volicer, Harper, Manning, Goldstein, & Satlin, 2001). These researchers observed the residents for 15 minutes pre- and post-intervention and during the 30-minute intervention, which consisted of the residents being invited and encouraged to sing familiar songs with a music therapist. The therapist sang individually preferred and "gentle, soothing waltz-tempo songs" (p. 9) with instrumental accompaniment (not specified). She used imitation, repetition, *a cappella* singing, and other techniques to reinforce and extend the residents' responses. Frequency and duration counts indicated that anxiety decreased from 24% pre-intervention to 4% during singing, which was a significant change. Also

significant was an increase of 52% in eye contact/smiling/gesturing/touching others. The finding most important to the present study, perhaps, is that duration of sitting with the group rose from 38% during the pre-intervention observation period to 75% during the singing, with the increased response sustaining into the 15-minutes following the therapy session.

Although sessions were not intentionally timed to occur just before a meal in either the Götell, Brown, and Ekman (2000) or the Lesta and Petocz (2006) studies, the "carry-over" effects reported by these authors may have direct implications for mealtime, especially if a lack of vitality and social anxiety that leads to distraction and wandering away from other people (and thus from the food source) are interfering factors in nutritional intake.

Singing and Nutritional Intake

We were unable to uncover any music therapy studies that have targeted a connection between singing, specifically, and nutritional intake. However, one study warrants mention here. Moore (2010), a nurse, worked with residents with early to late stage dementia, engaging them in familiar, in-seat exercises to familiar background music from the 1920's to 1950's just prior to the mid-day meal. Assistants who were blinded to the condition observed participants in the treatment group. The eating ability and dietary consumption for each resident was calculated after the meal. There were no noteworthy reductions in agitation or feeding ability; however, both apathy and dietary intake were significantly positively impacted in the treatment group. While the role of music was as a structure for physical engagement, it is apparent that the residents actively engaged with the music. Moore writes,

> Many residents sang along despite low MMSE and most participated in the activity at a level of 4 to 5. Some stood to dance and clap with the music and many laughed when 'scrubbing the wash' (p. 98).

Research Question

The impetus for the present pilot study was not only to address an apparent lack of published research on this topic, but also a desire to systematically and empirically test our long-held clinical observations and curiosities about the impact of singing. This desire was coupled with our shared investment in improving the quality of life of individuals with ADRD and their caregivers. The primary question that we posed was as follows: Will residents' active engagement in singing lead to subsequent, productive changes in nutritional intake? Our prediction was that residents with ADRD who were actively engaged in singing during music therapy sessions immediately prior to their mid-day meal would show significantly greater overall nutritional intake for that meal when compared with participants who are not involved in pre-meal singing.

Definitions

Vocal Re-Creative Music Therapy. From this point forward, we have elected to use the term "vocal re-creative music therapy" (VMT) versus "singing" to describe the independent variable. Herein, VMT refers to a music therapy method (Bruscia, 1998) in which residents sing pre-composed songs under the direction of and with live music accompaniment by a board certified music therapist. We use this term because it is indigenous to music therapy clinical practice and because it offers more precision in describing the independent variable. Vocal re-creation, by definition, portrays the *client's* relationship to and active engagement in the music experience, rather than the *therapist's*

relationship and engagement.

Active Music Engagement. One way to define the concept of "active engagement" is as "the act of being occupied or involved with an external stimulus" (Cohen-Mansfield, Dakheel & Marx, 2009 p. 4). Until recently, research involving the concept and measurement of active engagement among residents with dementia had been mostly absent from the professional music therapy literature. In an attempt to counter this deficit, Cohen-Mansfield, Dakheel, and Marx (2009) formulated the Comprehensive Process Model of Engagement, which asserts that engagement is affected by three distinct yet inter-related attributes: the environment, the stimulus, and the person. Environmental attributes include such things as the location of the stimulus, the time of day, and the manner of presentation. Stimulus attributes pertain to such things as the degree to which the stimulus has social, manipulative, or work-related characteristics. Finally, attributes of the person refer to such things as resident demographics (including pre-morbid interests) and cognitive functioning level.

We incorporated this model into our thinking as we defined "active engagement in singing": *One or more of the environmental, stimulus, and person attributes of the total music experience result in sustained sensorial and cognitive focus of the residents. Furthermore, active engagement in singing yields an observable level of self-expression and/or social interaction within the experience.*

Method

Design

This was a two-group randomized experiment.

Participants

All 15 participants were residents of a memory support unit within a larger care facility for older adults in the U.S. Midwest. Although these individuals were not malnourished at the time of the study, they were selected because they were considered to be at risk for malnutrition by virtue of their ADRD diagnosis. Additionally, the facility music therapist and administrative staff took interest in the research topic, and the facility was in close proximity to the research institution.

Permission to conduct the study was granted by the respective review boards of the participating institution and care facility. Informed consent was obtained from the legal guardians of all participants (see *Appendix A—Informed Consent*). Once guardian consent was obtained, the residents were randomly assigned to one of two groups, with seven in the control wait-list group (CWL) and eight in the vocal re-creative music therapy group (VMT). The randomization process involved writing the names of each of the 15 residents on a slip of paper, placing these in a container, and drawing the first eight to be assigned to the treatment group, with the remaining to be placed in the CWL group.

Insert Table 1 about here.

Table 1 includes demographics for all residents involved in the study, including sex, age, scores on the Mini Mental State Examination (MMSE) (Folstein, Folstein, & McHugh, 1975), and primary and secondary diagnoses included in the residents' facility charts. In all, twelve women and three men participated, with an age range of 78 to 98 years. MMSE scores ranged from 12 to 24, and all individuals had a primary diagnosis of Alzheimer's Disease or Dementia. Of the 14 participants who had been administered the Geriatric Depression Scale (Yesavage et al., 1982), 6 scored greater than 5 points

(suggestive of depression), and 2 of these individuals scored above 10 points, which almost always indicates depression.

The VMT and CWL group members were determined to be similar on key demographics such as age range (VMT 78-98; CWL 81-94), average age (VMT M = 87.5; CWL M = 86.3), gender (VMT: 7 women, 1 man; CWL: 5 women, 2 men), and overall cognitive functioning, which, for all but one resident fell within the borderline to impaired range. All participants were self-feeders. While some residents were prescribed and/or offered appetite stimulants and nutritional supplements, the protocols for administration of these did not change during the course of treatment; therefore, these factors were not considered as confounding.

None of the participants had severe to profound hearing loss; all were able to hear conversation and music in normal to slightly elevated decibel levels. All participants were capable of vocalizing and able to verbalize and sing lyrics.

Procedures

On Monday, Tuesday, Thursday, and Friday during Weeks 1, 2, and 3, the residents in the VMT group were escorted to a common activity area on the unit approximately 30 minutes prior to lunch. They were seated in a semi-circle facing an electronic keyboard on a stand. Two session facilitators participated in the study, alternating leadership every other session. The decision to use one facilitator per session was based on the concern that two simultaneous leaders may have been confusing or distracting for the residents, as well as on the desire to imitate typical clinical settings—in which music therapists singularly lead group sessions—so that the study might be more easily replicated and findings more pertinent. One of the facilitators was a male, board-

certified music therapist with several years of clinical experience, and the other was a female, senior-level, undergraduate music therapy student with approximately 5 months of supervised pre-clinical, part-time training in two different care facilities.

The same 11 American popular songs were used in each session (see *Appendix B—Song List*). Songs were selected on the basis of participant familiarity rather than preference, for the following reasons: (1) in the experience of the researchers, due to the memory loss that is characteristic of residents on this particular memory support unit, residents are typically unable to provide accurate verbal information regarding personal song preference, and such attempts often lead to frustration; (2) family members are often unable to accurately report resident song preference; and (3) even if song preference were able to be determined, there would be no way to accommodate preference for all individuals in the study.

In order to insure familiarity with the song material, the ages of the residents were carefully considered. It was noted that the residents on the unit fell naturally into two homogeneous subgroups according to birth year. However, all shared one decade of music—from 1936 to 1945—during which their ages would have fallen somewhere between 15 and 25 years, considered to be the young adult years in which music listening habits and preferences are solidified (Gibbons, 1977; Jonas, 1991; Moore, Staum, & Brotons, 1992; Vanweelden & Cevasco, 2007). Once this common decade had been determined, the researchers perused a website with information pertaining to Billboard rankings of music since the inception of this particular ranking system (http://tsort.info/music/). Instrumental pieces were extracted. From the remaining songs, two of the researchers on the team each created a “short list” including at least one song

from each year of the decade in question. The first selected 30 that met the following inclusion criteria:

1. Rated in the top ten during the decade (except for one);
2. Fell within a slow to medium (rather than fast) tempo range (Moore, Staum, & Brotons, 1992);
3. Represented one of a variety of sub-genres, such as patriotic, Broadway, "sweet" songs, "light swing", etc.;
4. Had a lyrical form conducive to singing (i.e., with repetition to support recall); and
5. Could be recreated on piano or guitar with stylistic accuracy.

The second researcher (the music therapist at the care facility) developed her list based on clinical experience with the residents on the unit. She chose 12 songs that the residents had "absolutely been exposed to" in her previous work with them. When the two lists were compared, it was found that all 12 of the music therapist's songs appeared on the other researcher's list of 30. Eventually the list was shortened to 11 to accommodate the anticipated session length.

Each therapist used a mix of acoustic guitar and electronic keyboard accompaniment. The song sequence was randomized, with the exception of the opening song, "You Are My Sunshine." The facilitator often provided a 15 to 30 second verbal introduction to the history of the songs, features of their performance, etc. as a way to contextualize the experience and more fully engage the residents in singing along. The same keys and general accompaniment arrangements were used in each session, regardless of the song presentation order. Each of the 12 sessions lasted approximately 25

minutes, and in all but one case in which 10 songs were used, all 11 songs were presented.

Dining Environment

At the conclusion of each session, participants were escorted to one of two dining rooms (positioned on opposite ends of the unit), where they followed their typical routine for the mid-day meal. Each room was approximately 390 square feet, not including a small kitchenette with cabinets and appliances. One wall was comprised of windows, which afforded natural light and a view of a resident-accessible courtyard. Overhead fluorescents provided additional lighting. Each room accommodated 14 residents at three 4-top tables and one 2-top table. Resident seating was assigned and did not change during the course of the research. Two nursing assistants helped the residents find their seats and attended to their mealtime needs. Dietary staff and a LPN were on duty during lunch, splitting their time between the two dining rooms.

In one dining room, the staff consistently played a satellite radio station of music exclusively from the 1950's. Volume was ascertained to be low and presumably out of hearing range of many of the residents; in fact, the music was entirely inaudible on video footage acquired during the testing (see below). Because the radio was a feature of the one dining environment that pre-dated the inception of the study, and because we were intent on preserving the residents' natural living environment to the maximum extent possible, we did not request that the background music be discontinued.

Data Collection

Care facility statistics for nutritional intake for VMT and CWL participants were collected for three weeks prior to the treatment period (baseline) and during treatment.

The software tool used to collect nutritional consumption data was CareTracker® by Ingenix, an electronic medical records system designed for facility staff to record information related to the residents' functioning, including activities of daily living (e.g., bathing, dressing, eating, etc.). All staff members who recorded data during the study had been trained in the system. The CareTracker® detail report accessed for the study indicated meal intake percentages per meal (25, 50, 75, or 100 percent) per resident. The report is described as one that may be helpful in determining the time of day to initiate an appropriate weight loss prevention intervention.

Video cameras were positioned to record residents during the meal as a supplement to the meal intake data. In one dining room, the camera was placed on a tripod in the corner of the room; in the other, it rested on a table top just outside the dining room entrance.

Results

Raw data for nutritional intake during baseline and treatment conditions appear in Tables 2 – 5. (The reader will note several missing data values [-], a factor that will be discussed below.) "Ref" means that the resident refused to eat; this equates with zero percent intake.

Insert Tables 2 – 5 about here.

Figures 1 and 2 show the average intakes of the participants in the VMT and the CWL groups, respectively, during both the baseline and treatment periods.

Insert Figures 1 – 2 about here.

The figures demonstrate that there were no compelling trends in food intake. In the VMT group, the mean food intake during the treatment period was slightly higher than that

during the baseline period for most (six of eight) participants. One participant's intake during the treatment period was nearly twice her intake during the baseline period. However, two participants' intake decreased sharply from the baseline to the treatment period. In the CWL group, most participants' intake was higher during the treatment period than during the baseline period. However, all increases and decreases were minor.

Due to the small sample sizes, any statistical tests of hypothesis (*t*-tests) would have very low power, that is, a low probability of detecting an effect that is present. In addition, there were a number of missing data values; for a variety of reasons, the food intake for some participants on some days was not recorded. Therefore the data are not suitable for statistical analysis (such as hypothesis testing), and should not be used to draw conclusions beyond the group of participants in this study. However, the data do provide some useful information.

The mean intake of the treatment group during the treatment period was 72.8%, while the mean intake for the control group was 85.6%. These group averages do not support our prediction that vocal re-creative music therapy leads to increased intake.

We also computed the intake adjusted for the baseline period for each participant. For every treatment day, each participant's mean intake over the entire baseline period was subtracted from that day's intake. The mean adjusted intake was then calculated for each of the two groups. For the VMT group, the adjusted mean was 4.18, and for the CWL group, the adjusted mean was 2.68, confirming that the VMT group did not demonstrate a greater increase in food intake than the CWL group.

Discussion

Evaluated against baseline consumption, VMT participants showed no notable increases during the treatment period. Furthermore, when we compared scores for the two groups during the treatment period only, we learned that residents in the CWL group on average actually ate *more* food (85.6%) than those in the VMT group (72.8%). While it is conventional in this section of the research report to offer an interpretation of such findings—perhaps especially warranted in this case because the findings run counter to what we predicted based on our previous clinical experience—, initially we are duty-bound to address three factors that may have significantly compromised study validity and our ability to construe meaning from the results: sample size, duration of data collection period, and missing data values in the CareTracker® recording system due to a breakdown in the data collection method.

The small sample size was problematic but unavoidable. Due to the many medical, physical, emotional, and daily living needs of individuals with dementia, memory support units such as the one targeted in this study are typically small. As a research team, we agree that a group size of 7 to 8 residents was ideal in terms of ease and efficacy of session facilitation. Furthermore, the small size enabled compassionate care for the residents; that is, each resident was able to receive immediate and complete attention to any expressed needs during the course of the sessions; this is something that may not have happened had the groups been larger. And yet, we recognize that a larger sample would have contributed to more robust data with a greater capacity for generalization of findings. A replication of this design at several care facilities may enable researchers to balance these various considerations.

We had access to the VMT and CWL participants for six weeks; this time frame was determined by both the residents' and our availability for the project. Because we were ethically obliged to provide the CWL group with equal access to music therapy services, we divided the time in half, collecting data for three weeks and providing services to the CWL for an additional three weeks. A longer treatment period certainly would have been preferable in terms of gathering more meaningful data.

Perhaps the most troubling aspect related to the data is that, as noted above, intake data values were absent from the records. Of 360 possible data values to be collected during the study, 59 (over 15%) were missing, and none of the residents had complete data sets for both phases (baseline and treatment). As a result, a repeated measure analysis of variance was not feasible. We did not anticipate this outcome. Retrospectively, we have determined three plausible causes. The first is that the nursing assistants who are responsible for recording this data during their shift did not complete the required charting prior to the end of their shift, at which point the CareTracker® system essentially denies entry. (This would be impossible to confirm unless the implicated staff member shared this information.) Second, some participants were absent during mealtime, having left the facility premises with family members or friends. On two separate occasions, intake was not recorded for members of the VMT group because they left the facility for a meal with family members with no staff present to record meal intake. Finally, if a resident accepted a nutritional supplement (i.e., health shake) in lieu of a regular meal, this information was recorded elsewhere and no percentage of meal consumption was recorded.

We have generated some viable explanations for the results, beyond notions that the data were insufficient or the treatment itself was ineffectual. First, although not a deficit of data, per se, the validity of the measure could be called into question for this particular study in that the CareTracker® system requires the *merged recording of solid food and liquid intake* with the meal. It is possible that certain residents initially consumed more liquid than usual (perhaps in response to using their voices more than usual) and therefore ingested less solid food in which nutrients are found. The data collection system would not have been able to capture this potentially important nuance. Our insights about limitations of the system (i.e., recording time sensitivity and merged liquid-solid recording) surfaced only after data collection was complete and point to the value of incorporating multiple measures of consumption in subsequent research.

Intake results for the residents who received therapy also may be attributed to the fact that, although all study participants were considered at risk for malnutrition by virtue of their ADRD diagnosis, records show that few were eating on average less than 50% of their lunch prior to the treatment period (CWL=0; VMT=3) and none were eating less than 25%. It is possible that greater differences would have been apparent among a sample with more extreme indicators of risk for malnutrition. It is also possible that the percentages recorded were not an accurate reflection of consumption due to the fact that at least one resident was observed on a dining room videotape hiding food in her napkin. The hiding of food and other objects has been linked to moderate stage dementia (Hwang, Tsai, Yang, Liu, & Ling, 1998).

The results may have been influenced by the fact that the facility espouses a "Person Directed Living" philosophy. Thus, residents are given the opportunity to

determine what time they wish to rise each morning. All residents are offered breakfast when they get up, regardless of the time of morning. It follows that, if a study participant had eaten a late breakfast on a particular day due to rising late, she or he may not have been hungry at the prescribed lunchtime. Retrospective examination of CareTracker® records related to breakfast intake may have shed light on the prevalence of this situation.

On many treatment days, the time between the last song and the start of consumption was much longer than we had anticipated and planned for due to staggered start times in the dining room. Our vision was that the residents would leave the session room, walk down the hall to the dining room, get seated, and start eating, all within a few minutes; this did not happen consistently. In some cases, because of the facility schedule and other reasons, residents in one of the dining rooms were not served until up to 20-25 minutes after the cessation of the session. Of course, this type of unpredictability is a characteristic of research conducted in natural (versus laboratory) environments. But, in the case of individuals with dementia, 20-25 minutes may be long enough to negate any "carry over" effects of music intervention observed by other researchers (Götell, Brown & Ekman, 2009; Lesta & Petocz, 2006). On the other hand, it bears noting that upon viewing the videotapes, we observed certain residents in both dining rooms singing and whistling fragments of session material during the meal, which indicates some internalization—and perhaps conscious awareness—of "recent past" music experiences.

In order to preserve the temporal precedence necessary to claim a causal relationship and yet allow for more control of latency between treatment and consumption, future studies might be designed so that sessions occur in the dining environments and continue up until the moment that food is served. (Note: We

considered this design, but ultimately decided that it would not be in the best interest of the residents to hold music therapy sessions in the dining rooms, as asking them to do anything but eat in this environment might contribute to their confusion.) Since there were two dining rooms on the unit, sessions would have needed to occur more or less simultaneously in each of the dining rooms. This would have led to additional challenges, such as what to do about the co-mingling of CWL and VMT group members in the two rooms, and how to avoid the "bleeding through" of sound on the unit.

As noted above, when taken as a whole, the VMT group showed no notable trends in consumption; however, most VMT group members increased average intake from baseline to treatment conditions. More specifically, six of eight residents in the VMT group increased their average intake during the treatment period by at least five percentage points.

The two residents in the VMT group whose average intake decreased during treatment may have been special cases. Participant 7B went from an average intake of 45.5% to 22.5%. However, it bears mentioning that this resident was absent for 2 of the 12 VMT sessions due to illness and an appointment at the facility beauty parlor. (Data values were missing for these two days.) Additionally, during the baseline period, staff conducted a thorough assessment of this resident due to concerns about declining communication, greater resistance to care (including rejecting assistance during meals), and weight loss. It could be that, at the start of treatment, this resident was entering a period of significant (yet expected) deterioration that affected her consumption. In fact, at the time of this report, facility charts indicate that 7B continues to decline, refusing participation in many formerly beloved activities, including music therapy.

Participant 1B went from 37.5% during baseline to 20.5% during treatment. She was the resident who most often refused lunch during both phases of the study. Curiously, we discovered well into the study that she was found to have had a previous diagnosis of an eating disorder. On multiple occasions, although entirely positively engaged in the VMT session (i.e., singing, smiling, tapping her foot, interacting verbally with others, etc.), 1B stated upon entering the vicinity of her assigned dining room that her stomach was troubling her, and she subsequently refused to eat. When asked about her discomfort, 1B attributed it to the fact that she was menstruating—a clear biological impossibility at age 86. Obviously, this resident's ability to sustain the sense of wellbeing and joy that she appeared to gain from the VMT sessions was notably diminished by her dementia within a matter of minutes. Also noteworthy is the fact that this resident's medication regimen was altered in June, prior to the onset of the treatment. This alteration was prompted by increased anxiety and restlessness, classic symptoms of ADRD that may have negatively impacted this individual's ability to sit with peers in the enclosed space of the dining room.

Excluding raw data for these two residents, we find that remaining percentages suggest a degree of positive change in intake that substantiates the need for further systematic inquiry. Upon ex post facto examination, we found no such "special cases" in the CWL group.

As music therapists, we witness the transformative power of music within our sessions on a daily basis. This pilot study represents our attempt to determine if and how this perceived impact carries over into the daily lives of our clients—a topic that should be more thoroughly examined. With greater control of potential confounding factors, a

larger sample size, and more robust data, researchers may gain a truer and more complete picture of the value of singing engagement in the treatment of the malnutrition that can affect the health and quality of life of elderly residents with Alzheimer's Disease and related dementias.

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Appendix A – Informed Consent

Date

Greetings,

The music therapy programs at Bethany Village and the University of Dayton are collaborating to conduct a study titled, "The Effect of Pre-Meal, Vocal Re-Creative Music Therapy on Nutritional Intake of Residents with Alzheimer's and Related Dementias." The purpose of this study is to examine the effects of residents' engagement in singing just prior to lunch on their overall nutritional intake for that meal. As you may know, weight loss is a common problem among older adults with Alzheimer Disease (AD) and has been associated with mortality, disease progression, and poor quality of life. We would like to invite you to consider allowing your loved one to participate in this project. If you have received this letter in error, please accept our apology and disregard it.

Both Bethany Village and the University of Dayton support the practice of protection for human subjects participating in research. The following information is provided for you as you decide whether or not to allow participation in the present study. Your consent for your loved one's participation is solicited, but strictly voluntary. You and your loved one will experience no negative consequences should you choose not to participate in the study. Please be aware that even if you agree to participate, you are free to withdraw at any time without penalty. Participants will not be compensated for their involvement.

If you agree for your loved one to participate in this study, she or he will be randomly assigned to one of two groups. The first group (treatment group) will participate in 20-30 minutes of group singing four times per week for 3 weeks. This music engagement will take place just prior to lunch and will be facilitated by board-certified music therapists using guitar and piano accompaniment. The participants will be videotaped. (Consent to videotape your loved one was obtained upon his or her admission to Bethany Village.) During this 3-week testing period, the participants' nutritional intake during lunch will be calculated and charted by the Bethany Village staff, as is customary at the facility. Your loved one's diet plan will not be altered in any way, and all activities will take place in your loved one's natural care environment.

During the 3-week testing period, participants in the second group (control group) will not be engaged in music just prior to lunch, but rather will follow their typical daily routine at the facility. They will not be videotaped. Their nutritional intake during lunch will also be calculated and charted, as a basis of comparison with the treatment group. Once the testing period is completed, the participants in the control group will have the option of participating in the same music experiences as those in the treatment group, but no data will be collected during this time and your loved one will not be videotaped.

Should you choose to consent, potential benefits for your loved one include the enjoyment of participating in singing, the possibility of an increase in his or her nutritional intake, and the chance to contribute to a greater understanding about the role of music engagement in dementia care. There are no perceivable risks of participation,

apart from emotions that are experienced in response to music or participation in a group activity. If you do not desire for your loved one to participate in this study yet are interested in other courses of treatment or available activities, please contact the researchers for a list of alternatives.

The results of this study will be available to you should you choose to receive them. Results may be presented or published; however, your loved one will not be identifiable in any way in presentations or reports generated by this study, as all data will be presented in anonymous and/or aggregate form. The researchers will preserve the confidentiality of your loved one's participation; that is, only the research team and necessary facility staff will have access to participant information. Your loved one's privacy will be protected to the maximum extent allowed by law.

Any and all questions about this research project should be referred to Ms. Larisa McHugh, Principal Investigator, (937) 433-2110 ext. 6274, lmcHugh@graceworks.org. Any and all questions about your loved one's rights should be addressed to a) Mary Klein, Director of Organizational Integrity, Graceworks Lutheran Services, 6451 Far Hills Avenue, Dayton, Ohio 45459, (937) 436-6924 or b) Mary Connolly, University of Dayton, Chair of the Committee for the Protection of Human Subjects, (937) 229-3493, Mary.Connolly@notes.udayton.edu.

If you consent on behalf of your loved one, please print and sign your name in the spaces below and return this to Ms. Larisa McHugh, music therapist at Bethany Village. Thank you for your consideration. Sincerely,

Larisa McHugh, MA, MT-BC
Principal Investigator
Music Therapist, Bethany Village

Susan Gardstrom, PhD, MT-BC
Coordinator of Music Therapy, UD

James Hiller, MMT, MT-BC
Lecturer in Music Therapy, UD

Megan Brewer
Music Therapy Student, UD

* * * * * * *

By signing this form, I am indicating my understanding of the above information and my consent for my loved one's participation in the research study, "The Effects of Pre-Meal, Vocal Re-Creative Music Therapy on Nutritional Intake of Residents With Alzheimer's and Related Dementias."

Name of Resident: _____

Name of Guardian (print):_____

Signature of Guardian: _____Date: _____

Appendix B – Song List

1. Alexander's Ragtime Band
2. Don't Sit Under the Apple Tree
3. Glory of Love
4. God Bless America
5. I Don't Want to Set the World on Fire
6. Ma, He's Makin' Eyes At Me
7. Mairzy Doats
8. Oh, What a Beautiful Morning
9. Sentimental Journey
10. They Can't Take That Away From Me
11. You are My Sunshine

Table 1. Participant Demographics

CWL Group Members	*Sex*	*Age*	*MMSE*	*Primary Dx (Secondary Dx)*
1A	F	93	23	AD (HTN)
2A	F	83	13	AD (Depression)
3A	F	82	22	AD (Atrial Fib)
4A	M	91	20	Dementia* (HOH)
5A	F	81	17	AD (Depression/Anxiety)
6A	M	89	19	AD (Adjust Disorder w/ Depression)
7A	F	85	24	AD* (Anxiety)
VMT Participants	*Sex*	*Age*	*MMSE*	*Primary Dx (Secondary Dx)*
1B	F	86	21	AD (Depression/Anxiety)
2B	F	78	12	AD (Psychosis)
3B	F	86	13	AD (DMII)
4B	M	87	12	AD (CVA 2nd ICH)
5B	F	86	13	Dementia (Depression)
6B	F	98	13	AD (Depression)
7B	F	84	16	AD (DMII)
8B	F	95	17	AD (FTT)

* with behavior disturbances

Table 2. CWL percentage of lunch intake during baseline period.

Participant/Mean	6/21	6/22	6/24	6/25	6/28	6/29	7/1	7/2	7/5	7/6	7/8	7/9
1A (M=100)	100	100	100	100	100	-	100	-	-	-	100	100
2A (M=79.2)	100	50	75	100	50	75	75	25	100	100	100	100
3A (M=59.1)	ref	100	100	ref	100	ref	75	25	75	75	-	100
4A (M=70.5)	75	50	75	75	75	75	75	ref	100	75	-	100
5A (M=87.5)	100	100	-	100	75	75	100	75	75	75	-	100
6A (M=92.5)	100	75	-	100	100	100	75	100	100	75	-	100
7A (M=81.3)	100	75	75	100	100	100	75	75	100	75	50	50

Table 3. CWL percentage of lunch intake during treatment period.

Participant/Mean	7/12	7/13	7/15	7/16	7/19	7/20	7/22	7/23	7/26	7/27	7/29	7/30
1A (M=95.0)	100	-	100	100	100	75	-	75	100	100	100	100
2A (M=72.2)	75	-	25	75	100	75	-	-	100	75	50	75
3A (M=65.6)	75	-	100	100	100	75	-	-	ref	-	75	ref
4A (M=75.0)	75	-	100	75	100	75	-	25	50	75	100	75
5A (M=96.4)	100	-	75	100	-	100	-	-	100	100	100	-
6A (M=100)	100	-	100	100	-	100	-	-	100	100	100	-
7A (M=95.0)	100	100	100	-	100	100	75	75	100	100	100	-

Table 4. VMT percentage of lunch intake during baseline period.

Participant/Mean	6/21	6/22	6/24	6/25	6/28	6/29	7/1	7/2	7/5	7/6	7/8	7/9
1B (M=37.5)	75	-	ref	-	25	ref	50	25	75	ref	75	50
2B (M=89.6)	100	75	100	100	100	75	100	100	50	75	100	100
3B (M=94.4)	100	75	100	100	100	100	75	-	100	-	100	-
4B (M=93.2)	100	75	100	-	100	100	100	75	100	100	75	100
5B (M=88.6)	100	100	100	-	100	100	100	75	100	25	75	100
6B (M=29.5)	25	25	ref	-	50	25	ref	25	100	25	25	25
7B (M=45.5)	75	25	25	25	75	50	-	25	50	50	50	50
8B (M=82.5)	100	75	-	75	75	75	100	75	75	75	-	100

Table 5. VMT percentage of lunch intake during treatment period.

Participant/Mean	7/12	7/13	7/15	7/16	7/19	7/20	7/22	7/23	7/26	7/27	7/29	7/30
1B (M=20.5)	ref	ref	ref	ref	75	ref	ref	75	75	-	ref	ref
2B (M=95.5)	100	100	75	100	100	75	-	100	100	100	100	100
3B (M=100)	100	100	-	-	100	100	100	100	100	100	100	-
4B (M=100)	100	100	100	100	100	100	100	100	100	-	100	100
5B (M=97.5)	100	100	100	100	100	100	100	-	75	-	100	100
6B (M=57.5)	25	25	25	-	ref	75	75	100	75	75	100	-
7B (M=22.5)	50	25	25	-	ref	25	ref	25	ref	75	ref	-
8B (M=88.9)	100	-	100	100	100	75	-	100	75	-	75	75

Figure 1. A comparison of average (Avg) baseline and treatment intake in VMT group.

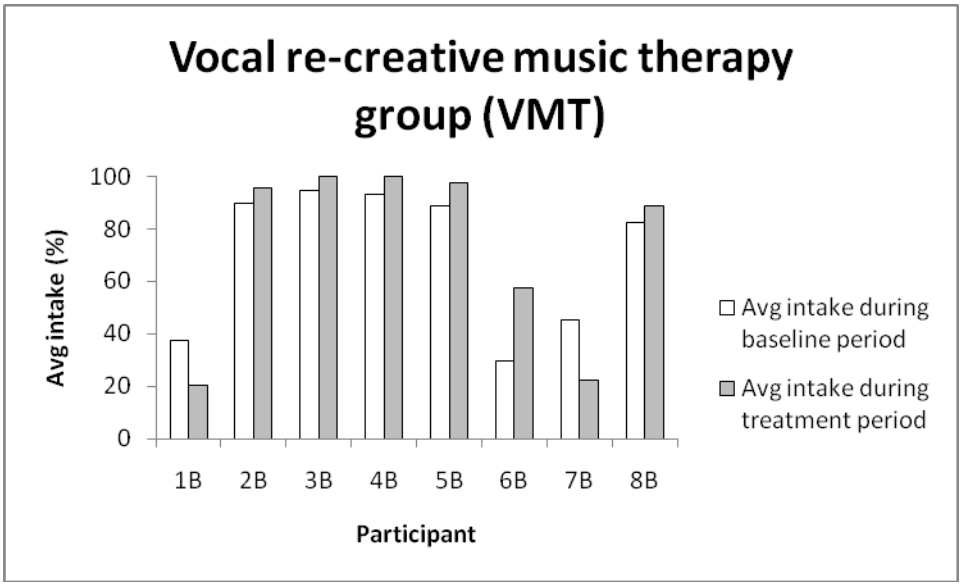

Figure 2. A comparison of average (Avg) baseline and treatment intake in CWL group.